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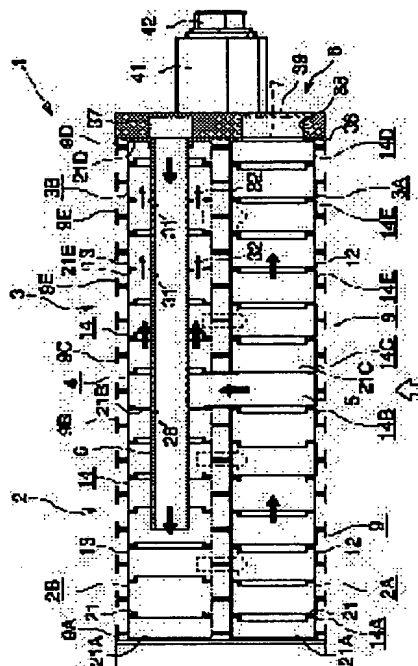
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## (54) HEAT EXCHANGER

(57)Abstract:

**PROBLEM TO BE SOLVED:** To improve the heat exchanging efficiency of the entirety.

**SOLUTION:** The heat exchanger comprises a plurality of heat exchanging parts 2, 3 provided to be aligned in a lateral direction and having a pair of front and rear headers 2A, 2B, 3A, 3B extended in the lateral direction, and a plurality of aligned tubes 2C, 3C having U-shaped passages 11 arranged at an interval in the lateral direction and communicating at both ends with the headers 2A, 2B, 3A, 3B. In this case, the rear header 3B of the part 3 adjacent to the header 2A of the part 2 communicates with the header 2A of the part 2 through a communicating member 4 having a fluid communicating passage 5 so that all the fluid introduced to the header 2B of the part 2 of the left end is discharged from the header 3A of the part 3 of the right end through the parts 2, 3. In all the parts 2, 3, the fluids flow from the headers 2B, 3B to the headers 2A, 2B through the passages 11.



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**CLAIMS**

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[Claim(s)]

[Claim 1] The heat exchange section equipped with two or more letter tube parts of juxtaposition which have U typeface fluid channel which set spacing to a longitudinal direction and one pair of headers are matched for it before and after extending to a longitudinal direction, and both ends were made to open for free passage by the order header So that more than one are prepared so that it may rank with a longitudinal direction, and the fluid introduced into the back header of the heat exchange section of a right-and-left any 1 edge may pass all the heat exchange sections and may be discharged from the front header of the heat exchange section of a right-and-left any 1 edge The heat exchanger which the back header of the heat exchange section which adjoins the front header of the heat exchange section and this is made open for free passage by the free passage member which has a fluid free passage way, and is made in all the heat exchange sections as [ flow / a fluid / to a front header / from a back header / through U typeface fluid channel ].

[Claim 2] A heat exchanger [ equipped with two or more letter of juxtaposition flat hollow objects with which the letter header formation section of bulge with which each heat exchange section consisted of a joined longwise rectangle metal plate of two sheets, and was connected among both metal plates to a letter of bulge U typeface fluid channel and the both ends of this is prepared ] according to claim 1.

[Claim 3] The heat exchanger according to claim 1 or 2 arranged so that a free passage member may consist of a metal plate of two sheets each other joined so that it might have a hollow for fluid free passage way formation and hollows might counter and the order header may be straddled between the adjoining heat exchange sections.

[Claim 4] The heat exchanger according to claim 1 or 2 arranged so that a free passage member may straddle the order header between the heat exchange sections which have the shape of a pipe by which mileage and order both ends were closed by the cross direction, and adjoin.

[Claim 5] A heat exchanger given in either of the claims 1-4 equipped with fluid installation tubing with which the right end closing wall in the back header of the right end heat exchange section is penetrated from an outside, and the tip results in the back header of the left end heat exchange section by which the fluid exhaust port is formed in the right end closing wall of the front header of the right end heat exchange section.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the heat exchanger used as an evaporator of a car air-conditioner.

[0002] In this specification, this and the opposite side shall be called back a front for the drawing 2 bottom, i.e., the upstream of the wind which a heat exchanger lets pass. Moreover, right and left of drawing 2 shall be called right and left.

[0003]

[Description of the Prior Art] Before and after extending to a longitudinal direction conventionally, as an evaporator used for a car air-conditioner One pair of headers, By consisting of the letter flattened tube section of juxtaposition which has U typeface refrigerant path which set spacing to a longitudinal direction, and it is allotted to it, and both ends were made to open for free passage by the order header, and a corrugated fin arranged between the adjoining flattened tube sections, and preparing a partition in an order header The path group which consists of two or more refrigerant paths made as [ flow / through U typeface refrigerant path / to a back header / from a front header / a refrigerant (fluid) ], While being divided into the path group which consists of two or more refrigerant paths made as [ flow / through U typeface refrigerant path / to a front header / from a back header / a refrigerant ], that by which both the paths group has been arranged by turns is known (refer to JP,11-159990,A). This evaporator consists of a joined longwise rectangle metal plate of two sheets. And two or more letter of juxtaposition flat hollow objects with which the letter order header formation section of bulge which stands in a row among both metal plates to a letter of bulge U typeface refrigerant path and the both ends of this and, by which the bulge width of face of a longitudinal direction was made more greatly than the bulge width of face of the longitudinal direction of a refrigerant path is prepared While it joins so that the order header formation sections may be open for free passage, and considering as an order header, it is formed by preparing a partition in an order header.

[0004]

[Problem(s) to be Solved by the Invention] however, in the part of a path group which consists of two or more refrigerant paths which were made as [ flow / through U typeface refrigerant path / to a back header / from a front header / a refrigerant ] in the case of the conventional evaporator Since heat exchange effectiveness is bad compared with the part of a path group which consists of two or more refrigerant paths made as [ flow / through U typeface refrigerant path / to a front header / from a back header / a refrigerant ], there is a problem that the heat exchange effectiveness as the whole also falls.

[0005] The purpose of this invention solves the above-mentioned problem, and is to offer the heat exchanger which may improve the heat exchange effectiveness as the whole.

[0006]

[The means for solving a technical problem and an effect of the invention] Before and after extending to a longitudinal direction, the heat exchanger by this invention One pair of headers, The heat exchange section equipped with two or more letter tube parts of juxtaposition which

have U typeface fluid channel which set spacing to a longitudinal direction, and it is allotted to it, and both ends were made to open for free passage by the order header So that more than one are prepared so that it may rank with a longitudinal direction, and the fluid introduced into the back header of the heat exchange section of a right-and-left any 1 edge may pass all the heat exchange sections and may be discharged from the front header of the heat exchange section of a right-and-left any 1 edge The back header of the heat exchange section which adjoins the front header of the heat exchange section and this is made open for free passage by the free passage member which has a fluid free passage way, and it is made in all the heat exchange sections as [ flow / a fluid / to a front header / from a back header / through U typeface fluid channel ].

[0007] Since it is made in all the heat exchange sections as [ flow / a fluid / to a front header / from a back header / through U typeface fluid channel ] according to the heat exchanger of this invention, the heat exchange effectiveness as the whole improves compared with the conventional evaporator.

[0008] In the heat exchanger of this invention, it may have two or more letter of juxtaposition flat hollow objects with which the letter header formation section of bulge with which each heat exchange section consisted of a joined longwise rectangle metal plate of two sheets, and was connected among both metal plates to a letter of bulge U typeface fluid channel and the both ends of this is prepared.

[0009] Moreover, in the heat exchanger of this invention, it may be arranged so that a free passage member may consist of a metal plate of two sheets each other joined so that it might have a hollow for fluid free passage way formation and hollows might counter and that order header may be straddled between the adjoining heat exchange sections.

[0010] Moreover, in the heat exchanger of this invention, the free passage member may be arranged so that that order header may be straddled between the heat exchange sections which have the shape of a pipe by which mileage and order both ends were closed by the cross direction, and adjoin.

[0011] Furthermore, in the heat exchanger of this invention, it has fluid installation tubing with which the right end closing wall in the back header of the right end heat exchange section is penetrated from an outside, and that tip results in the back header of the left end heat exchange section, and the fluid exhaust port may be formed in the right end closing wall of the front header of the right end heat exchange section. In this case, installation and discharge of the refrigerant to a heat exchanger can be performed from the same side.

[0012]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing. This operation gestalt applies the heat exchanger of this invention to the evaporator of a car air-conditioner. In addition, in the following explanation, the aluminium alloy other than pure aluminium shall be included in the word of "aluminum."

[0013] As shown in drawing 1 - drawing 4 , before and after extending to a longitudinal direction, an evaporator (1) One pair of headers (2A) (2B) (3A) (3B), The heat exchange section (2) equipped with two or more letter tube parts of juxtaposition (2C) (3C) which set spacing to a longitudinal direction, and it is allotted to it, and both ends were made to open for free passage by the order header (2A) (2B) (3A) (3B), and (3) Two are prepared plurality and here so that it may rank with a longitudinal direction, and the front header (2A) of the left-hand side heat exchange section (2) and the back header (3B) of the right-hand side heat exchange section (3) are made open for free passage by the free passage member (4) which has a refrigerant free passage way (5).

[0014] Moreover, while the evaporator (1) is equipped with refrigerant installation tubing (6) with which the right end closing wall in the back header (3B) of the right-hand side heat exchange section (3) is penetrated from an outside, and the tip results in the back header (2B) of the left-hand side heat exchange section (2), and (fluid installation tubing) The refrigerant exhaust port (7) and the (fluid exhaust port) are formed in the right end closing wall of the front header (3A) of the right-hand side heat exchange section (3). So that the refrigerant introduced into the back header (2B) of the left-hand side heat exchange section (2) by this may pass the two heat

exchange sections (2) and (3) and may be discharged from the front header (3A) of the right-hand side heat exchange section (3). In each heat exchange section (2) and (3), it is made as [ flow / a refrigerant / to a front header (2A) (3A) / from a back header (2B) and (3B) / through a tube part (2C) (3C) ]. Furthermore, while the refrigerant installation discharge member made from aluminum (8) has fixed to the right end side of the right-hand side heat exchange section (3) and a refrigerant is supplied to refrigerant installation tubing (6) through this refrigerant installation discharge member (8), a refrigerant is discharged from a refrigerant exhaust port (7). [0015] Each heat exchange section (2) and (3) consist of a joined longwise rectangle aluminum plate (9) (9A) (9B) (9C) (9D) (9E) of two sheets. And both aluminum plates (9) (9A) Two or more letter of juxtaposition flat hollow objects (14) (14A) (14B) (14C) (14D) (14E) with which the letter header formation section of bulge (12) which stood in a row to a letter of bulge U typeface refrigerant path (11), a (fluid channel), and the both ends of this, and (13) are prepared in between (9E) (9B) (9C) (9D) It has. The thickness of the longitudinal direction of the header [ order ] formation section (12) in each flat hollow object (14) (14A) (14B) (14C) (14D) (14E) and (13) is made more greatly than the thickness of the longitudinal direction of a letter of bulge U typeface refrigerant path (11). And while the external surface of the header [ order ] formation section (12) in an adjoining flat hollow object (14) (14A) (14B) (14C) (14D) (14E) and (13) is connected. By making the order header formation section (12) and (13) open for free passage, the heat exchange section (2) and (3) are formed, and between the parts corresponding to the refrigerant path (11) of an adjoining flat hollow object (14) (14A) (14B) (14C) (14D) (14E) is made with the ventilation flue (15). Moreover, the outside of the part corresponding to the refrigerant path (11) in the flat hollow object (14A) at the left end of the left-hand side heat exchange section (2), On and the outside of the part corresponding to the refrigerant path (11) in the flat hollow object (14D) at the right end of the right-hand side heat exchange section (3). The side plate made from aluminum (16) sets spacing, and is arranged, and between these flat hollow objects (14A) (14D) and side plates (16) is made with the ventilation flue (17), respectively. The corrugated fin (18) made from aluminum is arranged all ventilation flues (15) and (17), and it is joined to the flat hollow object (14) (14A) (14B) (14C) (14D) (14E) and the side plate (16). The aluminum plate (9) (9A) (9B) (9C) (9D) (9E) and the side plate (16) are formed in both sides with the aluminum brazing sheet which has a wax material layer, respectively.

[0016] The structure of the flat hollow object (14) except the flat hollow object (14A) (14B) of the right-and-left both ends of the left-hand side heat exchange section (2), the flat hollow object (14C) (14D) of the right-and-left both ends of the right-hand side heat exchange section (3), and two flat hollow objects (14E) of the pars intermedia of the right-hand side heat exchange section (3) is shown in drawing 5. As shown in this drawing, the aluminum plate (9) of the left-hand side which constitutes a flat hollow object (14). The hollow for refrigerant path formation of U typeface which consists of a horizontal level (19c) which connects a before side vertical section (19a), backside vertical sections (19b), and these lower limits (19). It is deeper than the hollow for refrigerant path formation (19), and has the hollow for both [ before and after standing in a row in each upper limit of order both vertical sections (19a) (19b) ] header formation (21). Both the vertical sections (19a) (19b) of the hollow for refrigerant path formation (19) are divided by the long protruding line (22) up and down. Moreover, two or more circular ribs (23) and abbreviation triangle-like corner heights (24) which form the semicircle arc turn section which makes smooth flow of the refrigerant from a backside vertical section (19b) to a before side vertical section (19a) are formed in the bottom wall of the horizontal level (19c) of this hollow (19). The long ellipse through tube (25) is formed in the cross direction at the bottom wall of the hollow for order header formation (21). The right-hand side aluminum plate (9) which constitutes a flat hollow object (14) makes this the right-and-left reverse sense in the same configuration as a left-hand side aluminum plate (9). In and the condition that the corrugated plate-like inner fin (26) made from aluminum was made to intervene between the bottom walls of two vertical sections (19a) (19b) of the hollow for refrigerant path formation (19). By brazing the peripheries of a right-and-left aluminum plate (9) and (9A), and protruding lines (22). The flat hollow object (14) which has the small path (27) of the letter of juxtaposition which has U typeface refrigerant path (11) and the order header formation section (12), and (13), and was formed in the vertical

section before and behind U typeface refrigerant path (11) with the inner fin (26) is formed (refer to drawing 4 ).

[0017] The flat hollow object (14A) at the left end of the left-hand side heat exchange section (2) Approximately in the left-hand side aluminum plate (9A) which constitutes this the depth of two hollows for header formation (21A) It is shallower than the hollow for header formation (21) of the aluminum plate (9) which constitutes a flat hollow object (14), and are almost equal to the depth of the hollow for U typeface refrigerant path formation (19), And it is the same configuration as the flat hollow object (14) which shows it to drawing 4 and drawing 5 if it removes that the ellipse through tube is not formed in the bottom wall of the hollow for header formation (21A).

[0018] The flat hollow object (14B) at the right end of the left-hand side heat exchange section (2) To the bottom wall of the hollow for back header formation (21B) in the right-hand side aluminum plate (9B) which constitutes this It is the same configuration as the flat hollow object (14) which shows it to drawing 4 and drawing 5 if it removes that an ellipse through tube is not formed but the circular through tube (28) for replacing with this and making refrigerant installation tubing (6) insert in is formed (refer to drawing 6 ).

[0019] The header formation section (12) before and behind the flat hollow object (14) (14A) (14B) with which the left-hand side heat exchange section (2) adjoins, and (13) are made open for free passage by the ellipse through tube (25).

[0020] The flat hollow object (14C) at the left end of the right-hand side heat exchange section (3) is the same configuration as the flat hollow object (14) which shows it to drawing 4 and drawing 5 if it removes that the ellipse through tube (25) is not formed in the bottom wall of the hollow for header formation (21C) by the side of before the left-hand side aluminum plate (9C) which constitutes this (refer to drawing 7 ).

[0021] Although the flat hollow object (14D) at the right end of the right-hand side heat exchange section (3) makes the flat hollow object (14A) at the left end of the left-hand side heat exchange section (2) the right-and-left reverse sense The circular through tube (29) in which refrigerant installation tubing (6) is made to insert is formed in the bottom wall of the hollow for header formation (21D) on the backside [ the right-hand side aluminum plate (9D) which constitutes this ], and the refrigerant exhaust port (7) is formed in it at the bottom wall of the hollow for header formation by the side of before (21D) (refer to drawing 8 ).

[0022] Two flat hollow objects (14E) in the pars intermedia of the right-hand side heat exchange section (3) While the circular through tube (31) in which refrigerant installation tubing (6) is made to insert instead of an ellipse through tube is formed at the bottom wall of the hollow for header formation (21) on the backside [ the right-hand side aluminum plate (9E) which constitutes this ] It is the same configuration as the flat hollow object (14) which shows it to drawing 4 and drawing 5 if it removes that the minor diameter through tube for refrigerant passage (32) is formed in circular through tube (31) order both sides (refer to drawing 9 ).

[0023] The header formation section (12) before and behind the flat hollow object (14) (14C) (14D) (14E) with which the right-hand side heat exchange section (3) adjoins, and (13) are made open for free passage by the ellipse through tube (25) and the minor diameter through tube (32).

[0024] As shown in drawing 10 , the free passage member (4) is formed by joining mutually the longwise rectangle aluminum plate (33) of two right and left. The left-hand side aluminum plate (33) equips with the long hollow for refrigerant free passage way formation (34) the cross direction formed in the upper limit section. The ellipse through tube (30) respectively long to a cross direction is formed in the both-sides [ order ] part in the bottom wall of the hollow for refrigerant free passage way formation (34). A right-hand side aluminum plate (33) makes this the right-and-left reverse sense in the same configuration as a left-hand side aluminum plate (33). And the free passage member (4) which has a refrigerant free passage way (5) is formed by brazing right-and-left aluminum plates (33). The bottom wall external surface of the hollow (34) in the left-hand side aluminum plate (33) of a free passage member (4) It is joined by the bottom wall external surface of the hollow for header formation (21) before and behind the right-hand side aluminum plate (9B) in the flat hollow object (14B) at the right end of the left-hand side heat exchange section (2), and (21B). The refrigerant free passage way (5) of a free passage

member (4) is made open for free passage to the front header (2A) of the left-hand side heat exchange section (2) by the ellipse through tube (30) of both aluminum plates (33) and (9B), and (25). The ellipse through tube (30) on the backside [ an aluminum plate (33) ] is closed by the bottom wall of the hollow (21B) of an aluminum plate (9B). Moreover, the bottom wall external surface of the hollow (34) in the right-hand side aluminum plate (33) of a free passage member (4) is joined by the bottom wall external surface of the hollow for header formation (21) before and behind the left-hand side aluminum plate (9C) in the flat hollow object (14C) at the left end of the right-hand side heat exchange section (3), and (21C). The refrigerant free passage way (5) of a free passage member (4) is made open for free passage to the back header (3B) of the right-hand side heat exchange section (3) by the ellipse through tube (30) of both aluminum plates (33) and (9C), and (25). The ellipse through tube (30) on the backside [ an aluminum plate (33) ] is closed by the bottom wall of the hollow (21C) of an aluminum plate (9C). Therefore, the front header (2A) of the left-hand side heat exchange section (2) and the back header (3B) of the right-hand side heat exchange section (3) are made to lead through the refrigerant free passage way (5) of a free passage member (4).

[0025] The circular through tube for refrigerant insertion (29) formed in the right-hand side aluminum plate (9D) which constitutes the flat hollow object (14D) at the right end of the right-hand side heat exchange section (3) lets refrigerant installation tubing (6) pass. It was inserted into the back header (3B), and while an ellipse through tube (25) lets it pass further, when a circular through tube (31) and (28) let it pass densely, the tip has reached the pars intermedia of the die length of the back header (2B) of the left-hand side heat exchange section (2). Here, as shown in drawing 11, as for the margin inferior of an ellipse through tube (25), and the path clearance X between refrigerant installation tubing (6), it is desirable that it is 2mm or more. Fall of refrigerant lateral pressure loss and increase of a heat exchanger duty can be aimed at suppressing the fall of disruptive strength to the minimum, if this path clearance X is 2mm or more, as shown in drawing 12.

[0026] As shown in drawing 8 and drawing 13, a refrigerant installation discharge member (8) consists of a plate (36) made to intervene between the letter body of a block (35), and the flat hollow object (14D) the left lateral of the letter body of a block (35), and at the right end of the right-hand side heat exchange section (3). The letter body of a block (35) becomes the right lateral of the thick plate-like base (39) where the hollow for refrigerant supply (37) and the hollow for refrigerant discharge (38) were formed in the left lateral, and a base (39) from the joint section (41) formed in one. Two male regio oralis (42) inserted in two female regio oralis of the joint member prepared in the expansion valve which is not illustrated in the joint section (41) and (43) are formed in one. And the through tube for refrigerant supply (44) extended from the tip of one male regio oralis (42) to the base of the hollow for refrigerant supply (37) and the through tube for refrigerant discharge (45) extended from the tip of the male regio oralis (43) of another side to the base of the hollow for refrigerant discharge (38) are formed in the joint section (41). The circular through tube (46) in which refrigerant installation tubing (6) is made to insert, and the free passage hole (47) which makes the hollow for refrigerant discharge (38) and refrigerant exhaust port (7) of a base (39) lead are formed in the upper limit section of a plate (36).

[0027] In this evaporator (1), the refrigerant introduced from refrigerant installation tubing (6) flows, as shown in drawing 2 and drawing 3, and it is discharged from a refrigerant exhaust port (7). That is, the refrigerant introduced from refrigerant installation tubing (6) flows first in the back header (2B) of the left-hand side heat exchange section (2), and divides and flows into U typeface refrigerant path (11) of all the flat hollow objects (14) (14A) (14B) of the left-hand side heat exchange section (2). And it flows to a front header (2A) side through U typeface refrigerant path (11) of all flat hollow objects (14) (14A) (14B), joins here, and flows through the refrigerant free passage way (5) of a free passage member (4) in the back header (3B) of the right-hand side heat exchange section (3). Subsequently, it divides and flows into U typeface refrigerant path (11) of all the flat hollow objects (14) (14C) (14D) (14E) of the right-hand side heat exchange section (3). And it flows to a front header (3A) side through U typeface refrigerant path (11) of all flat hollow objects (14) (14C) (14D) (14E), joins here, and is discharged through a refrigerant exhaust port (7).



[0028] And in both the heat exchange section (2) and (3), since a refrigerant flows the inside of U typeface refrigerant path (11) from a back header (2B) (3B) side to a front header (2A) (3A) side, it becomes the thing excellent in the heat exchange effectiveness between the air which flows a ventilation flue (15) and (17).

[0029] Drawing 14 and drawing 15 show other operation gestalten of this invention.

[0030] In the case of this operation gestalt, similarly the flat hollow object (14F) at the right end of the left-hand side heat exchange section (2) makes a left end flat hollow object (14A) the right-and-left reverse sense, but An ellipse through tube (50) is formed in the bottom wall of the hollow for header formation (21F) by the side of before the right-hand side aluminum plate (9F) which forms this, and the circular through tube (51) which makes refrigerant installation tubing (6) insert in the bottom wall of the hollow for header formation on the backside (21F) is formed.

[0031] Moreover, if the flat hollow object (14G) at the left end of the right-hand side heat exchange section (3) removes that the ellipse through tube (52) is formed in the bottom wall of the near hollow for header formation (21G) back [ in the left-hand side aluminum plate (9G) which constitutes this ], it is the same configuration as the flat hollow object (14A) at the left end of the left-hand side heat exchange section (2).

[0032] The free passage member (53) which has the refrigerant path (54) which makes the front header (2A) of the left-hand side heat exchange section (2) and the back header (3B) of the right-hand side heat exchange section (3) open for free passage is formed by closing square-pipe-steel (55) order both-ends opening made from an aluminum extruded section extended to a cross direction with the lid made from an aluminum brazing sheet (56). An ellipse through tube (57), (58), and (59) are formed in the anterior part of left-hand side wall order [ of square pipe steel (55) ] both parts, and a right-hand side wall, respectively. The external surface of the left-hand side wall of the square pipe steel (55) in a free passage member (53) It is joined by the bottom wall external surface of the hollow for header formation (21F) before and behind the right-hand side aluminum plate (9F) in the flat hollow object (14F) at the right end of the left-hand side heat exchange section (2). The refrigerant free passage way (54) of a free passage member (53) is made open for free passage to the front header (2A) of the left-hand side heat exchange section (2) by two ellipse through tubes (50) and (57). The ellipse through tube (58) on the backside [ the left-hand side wall of square pipe steel (55) ] is closed by the bottom wall of the hollow for header formation (21F) of an aluminum plate (9F). Moreover, the external surface of the right-hand side wall of the square pipe steel (55) in a free passage member (53) It is joined by the bottom wall external surface of the hollow for header formation (21G) before and behind the left-hand side aluminum plate (9G) in the flat hollow object (14G) at the left end of the right-hand side heat exchange section (3). The refrigerant free passage way (54) of a free passage member (53) is made open for free passage to the back header (3B) of the right-hand side heat exchange section (3) by two ellipse through tubes (52) and (59). Other configurations are the same as the 1st operation gestalt mentioned above, and give the same sign to the same part.

[0033] In the two above-mentioned operation gestalten, although each installation and discharge of a refrigerant are performed from right-hand side, a refrigerant may be introduced from one of right and left, and a refrigerant may be discharged from this another side. In this case, refrigerant installation tubing becomes unnecessary. Moreover, the above-mentioned operation gestalt is not restricted to this, although the case where the heat exchanger of this invention is applied to an evaporator is shown.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is the whole perspective view showing the operation gestalt which applied the heat exchanger by this invention to the evaporator.

[Drawing 2] It is a level expanded sectional view for both the heat exchange section order header unit of the evaporator shown in drawing 1 .

[Drawing 3] It is the perspective view showing the flow of the refrigerant of the evaporator shown in drawing 1 .

[Drawing 4] It is the level expanded sectional view of the refrigerant circulation space in a flat hollow object.

[Drawing 5] It is the decomposition perspective view of the flat hollow object except the flat hollow object of the right-and-left both ends of the left-hand side heat exchange section, the flat hollow object of the right-and-left both ends of the right-hand side heat exchange section, and two flat hollow objects of the pars intermedia of the right-hand side heat exchange section.

[Drawing 6] It is the decomposition perspective view showing the right-hand side aluminum plate which constitutes the flat hollow object at the right end of the left-hand side heat exchange section.

[Drawing 7] It is the decomposition perspective view showing the left-hand side aluminum plate which constitutes the flat hollow object at the left end of the right-hand side heat exchange section.

[Drawing 8] It is the decomposition perspective view showing the right-hand side aluminum plate and refrigerant installation discharge member which constitute the flat hollow object at the right end of the right-hand side heat exchange section.

[Drawing 9] It is the decomposition perspective view showing the right-hand side aluminum plate which constitutes two flat hollow objects in the pars intermedia of the right-hand side heat exchange section.

[Drawing 10] It is the decomposition perspective view showing the aluminum plate of two sheets which constitutes a connection member.

[Drawing 11] It is the partial enlarged drawing showing the relation between an ellipse through tube and refrigerant installation tubing.

[Drawing 12] It is the graph which shows the relation between the path clearance X between the margo inferior of an ellipse through tube, and refrigerant installation tubing, disruptive strength, refrigerant lateral pressure loss, and a heat exchanger duty.

[Drawing 13] the part of a refrigerant installation discharge member is expanded and shown — it is a notching right side view a part.

[Drawing 14] It is the sectional view of drawing 2 showing other operation gestalten which applied the heat exchanger by this invention to the evaporator.

[Drawing 15] They are the right-hand side aluminum plate which constitutes the flat hollow object at the right end of the left-hand side heat exchange section, the left-hand side aluminum plate which constitutes the flat hollow object at the left end of the right-hand side heat exchange section, and the decomposition perspective view showing a free passage member.

### [Description of Notations]

(1): Evaporator  
(2), (3): Heat exchange section  
: (2A) Before header (3A)  
(2B) (3B): After header  
: (2C) Tube part (3C)  
(4), (53): Free passage member  
(5), (54): Refrigerant free passage way (fluid free passage way)  
(6): Refrigerant installation tubing  
(7): Refrigerant exhaust port (fluid exhaust port)  
(9) [ (9F) / (9G) ] (9A) (9B) (9C) (9D) (9E): Aluminum plate  
(11): U typeface refrigerant path (U typeface fluid channel)  
(12), (13): Header formation section  
(14) [ (14F) / (14G) ] (14A) (14B) (14C) (14D) (14E): Flat hollow object  
(33): Aluminum plate  
(34): The hollow for refrigerant free passage way formation (hollow for fluid free passage way formation)

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[Translation done.]

\* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\* shows the word which can not be translated.

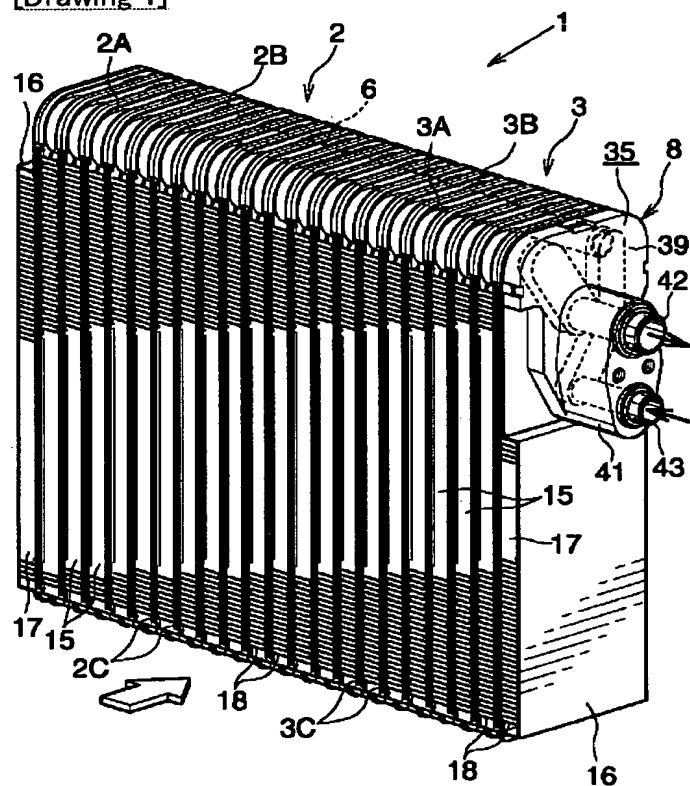
3.In the drawings, any words are not translated.

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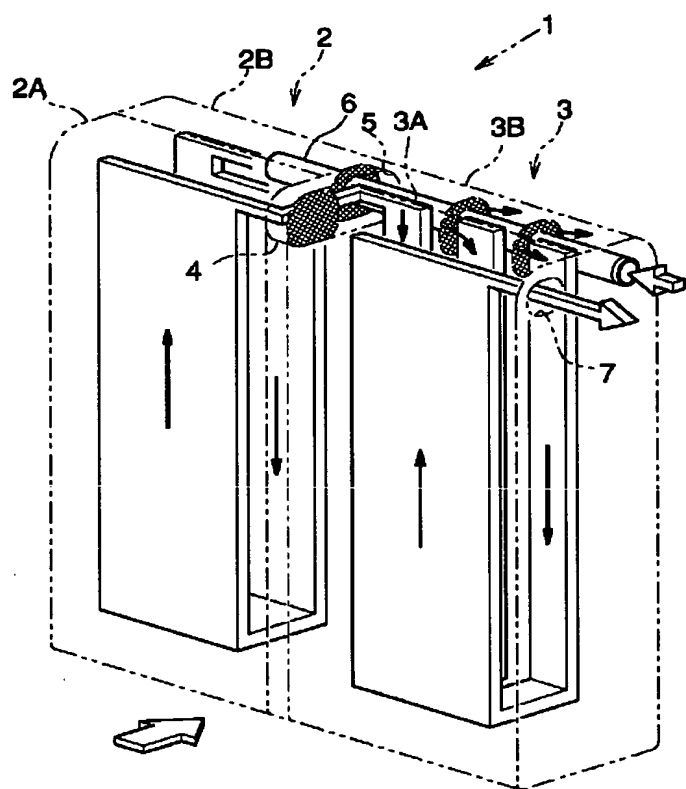
DRAWINGS

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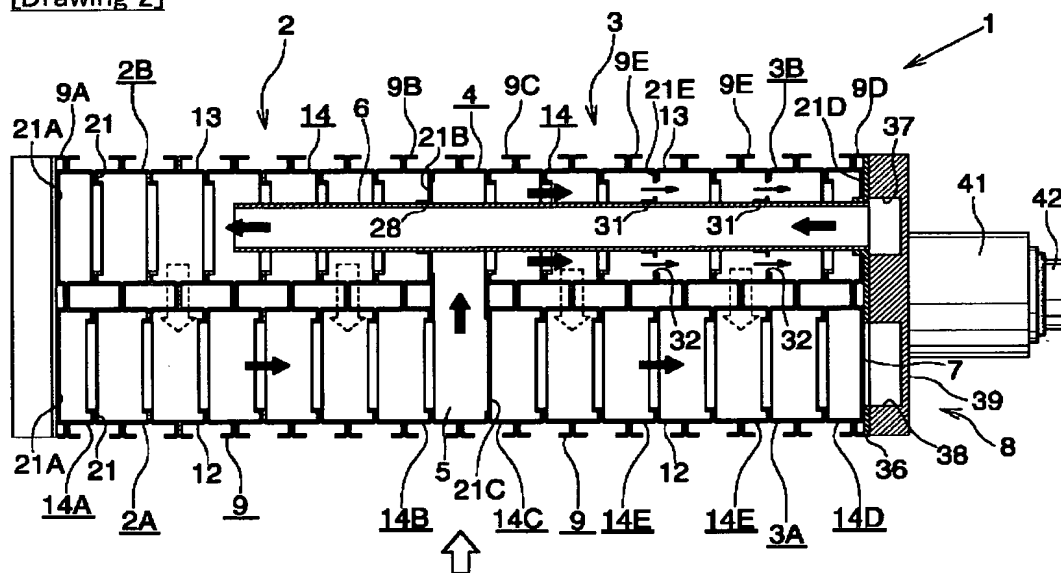
[Drawing 1]



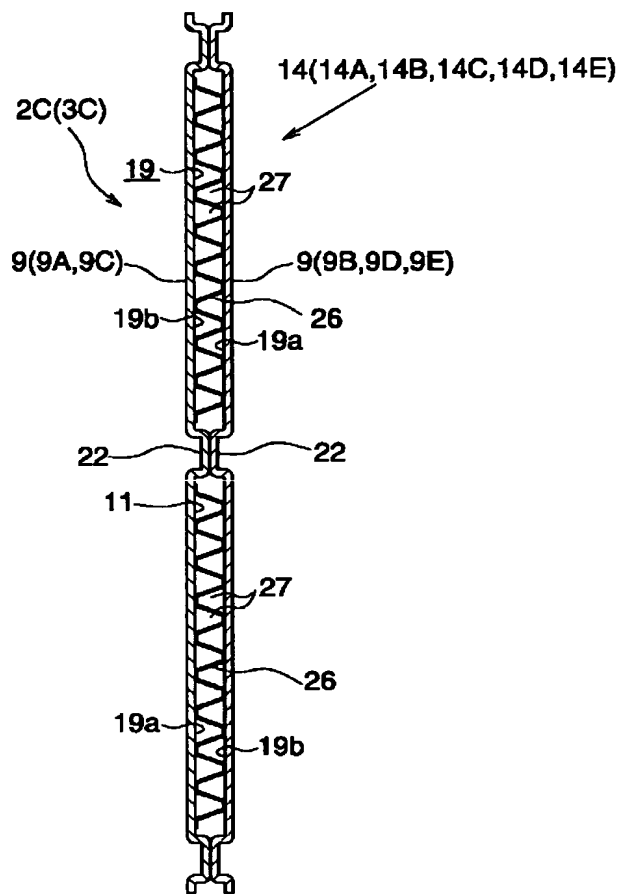
[Drawing 3]



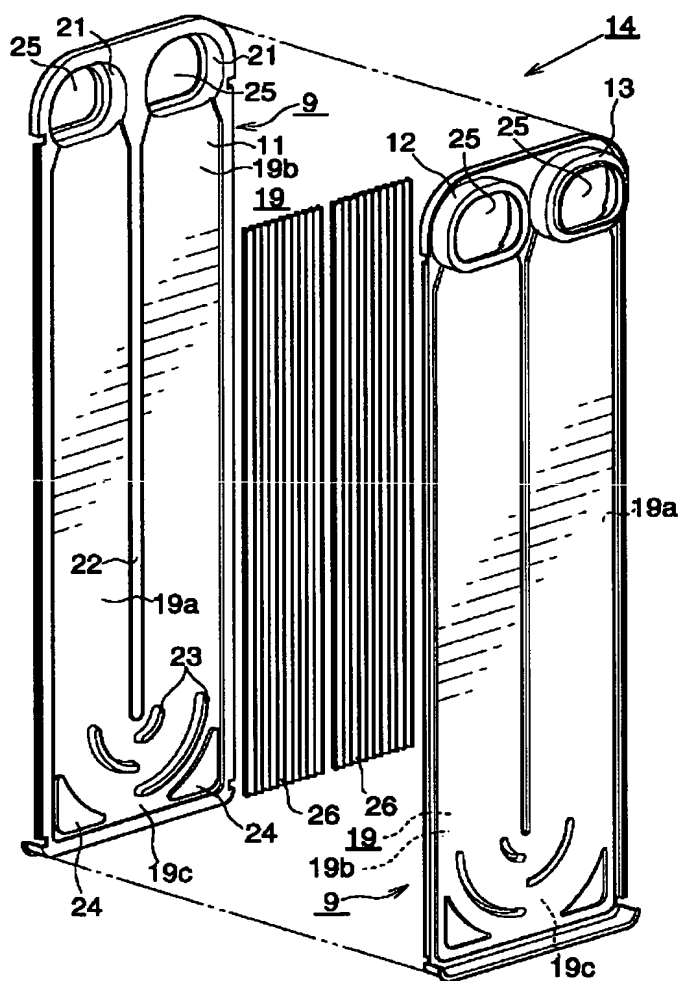
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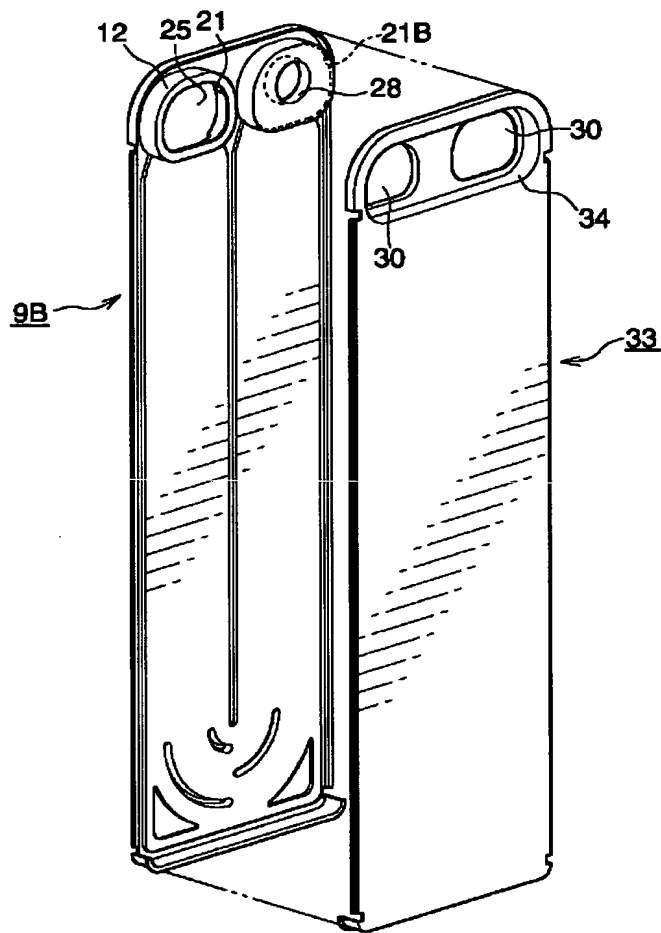
[Drawing 4]



[Drawing 5]

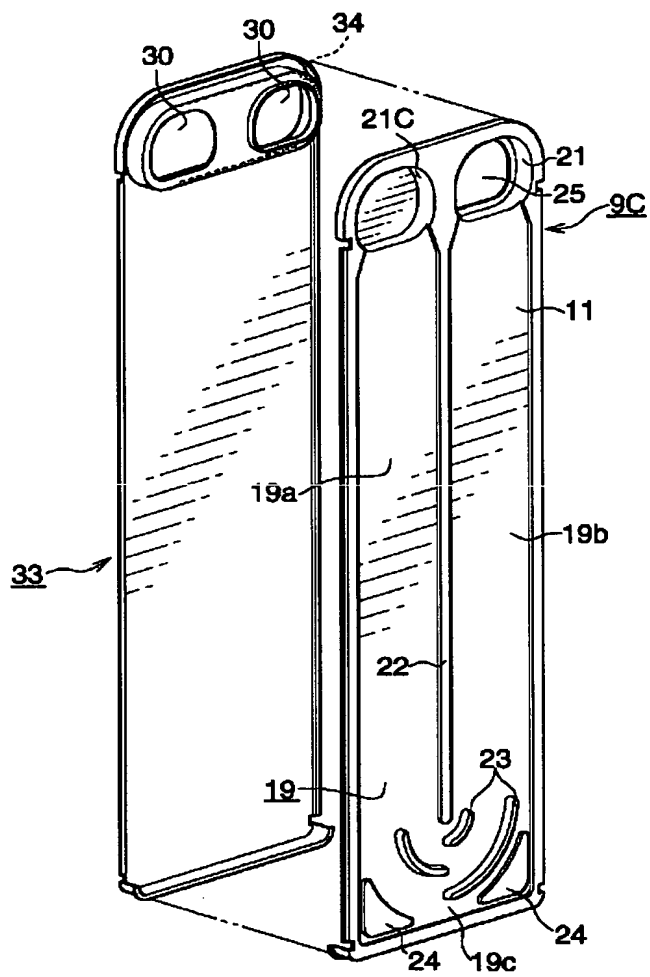


[Drawing 6]

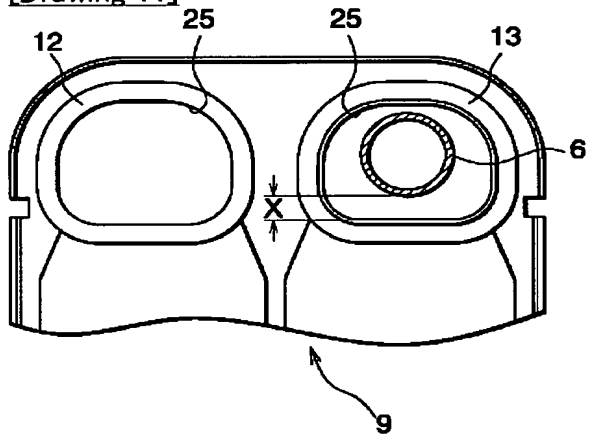


[Drawing 7]

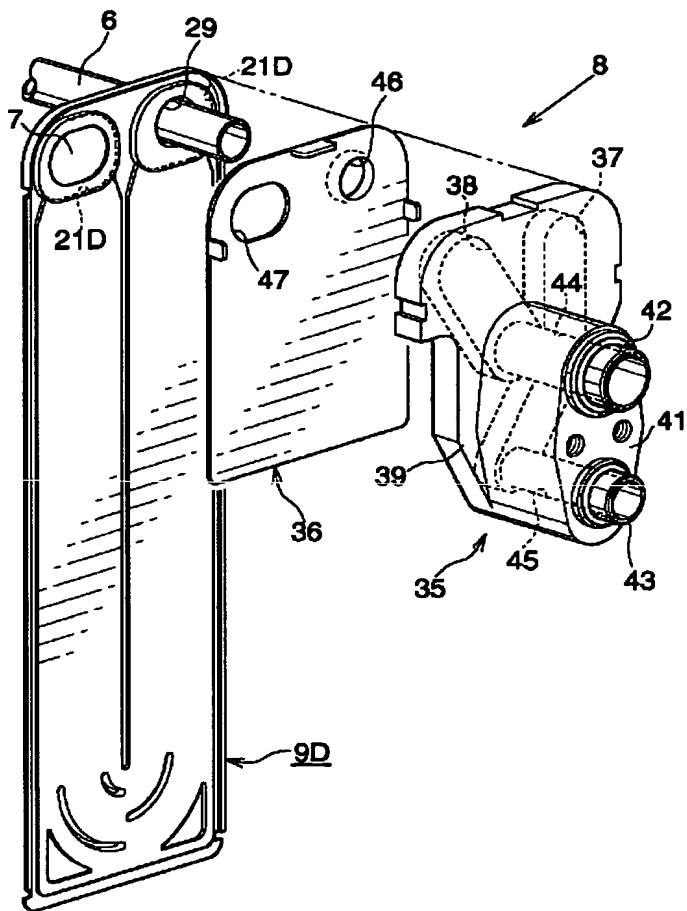




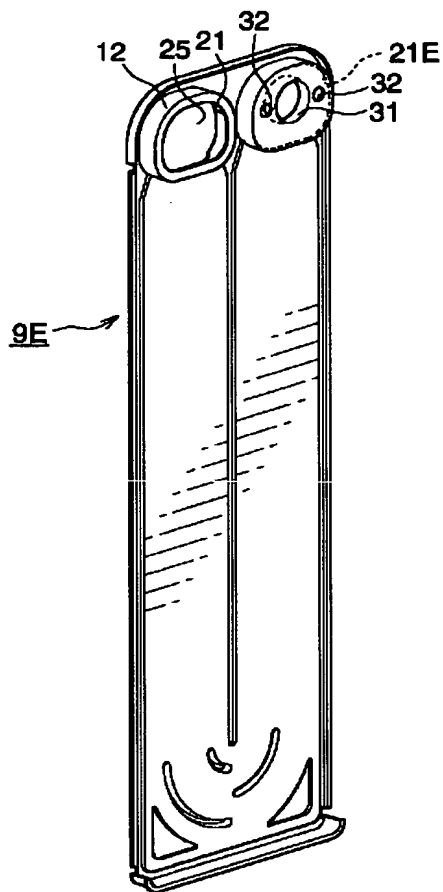
[Drawing 11]



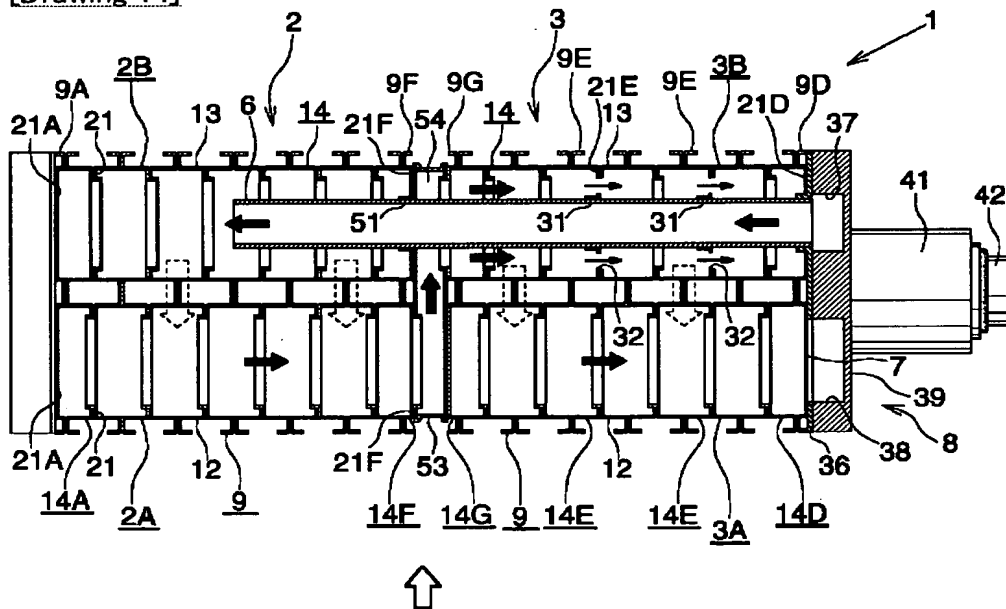
[Drawing 8]



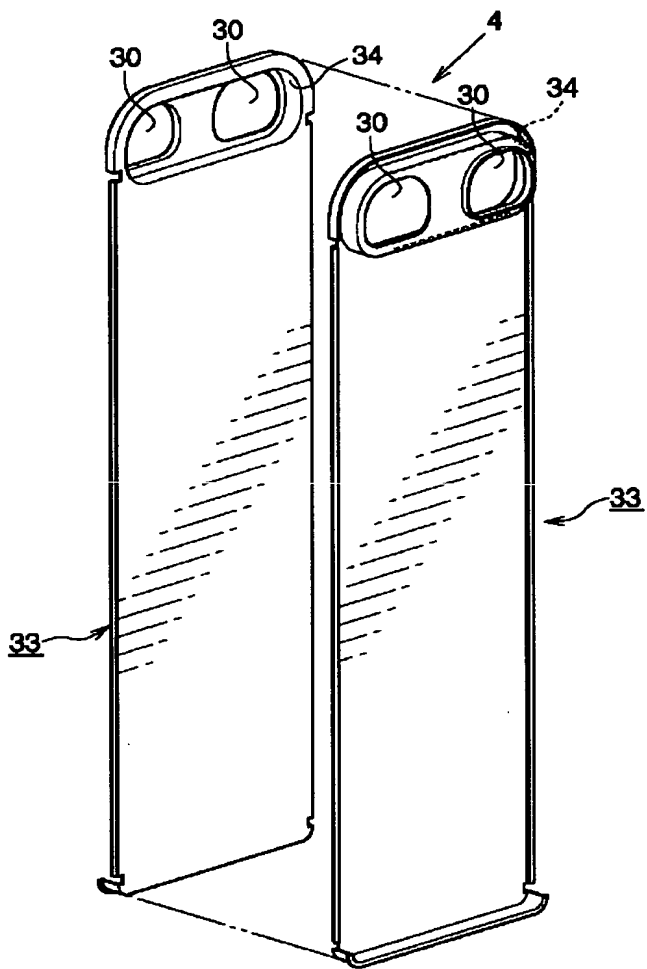
[Drawing 9]



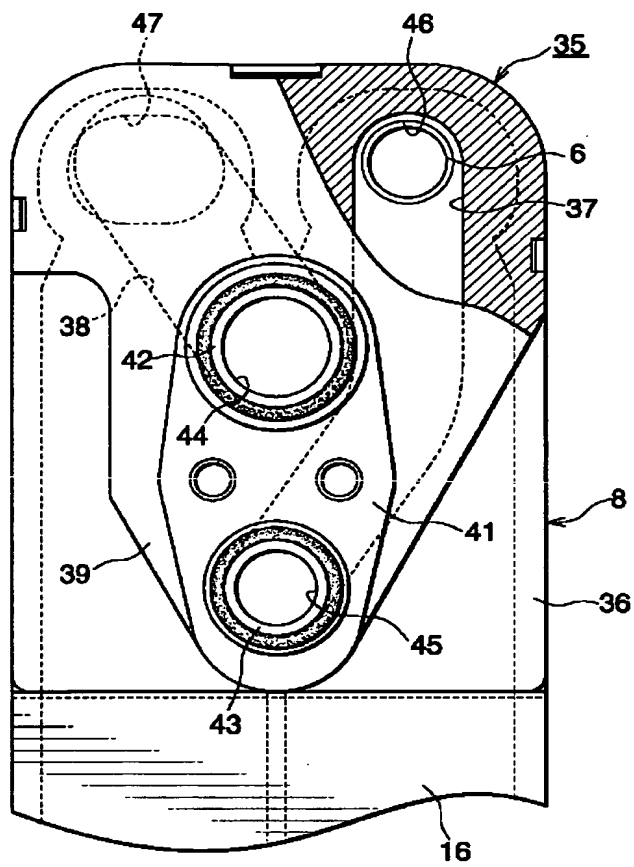
[Drawing 14]



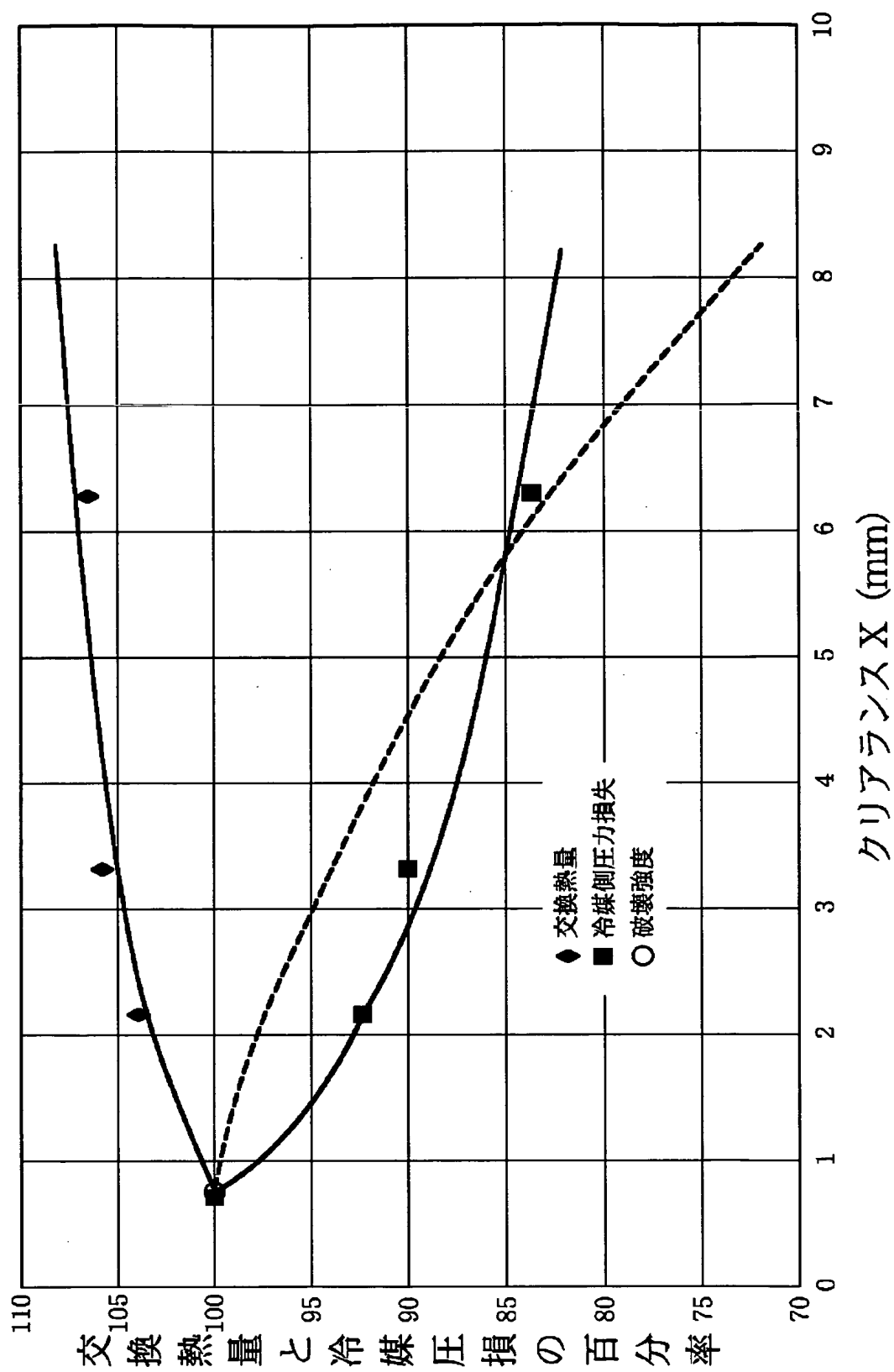
[Drawing 10]



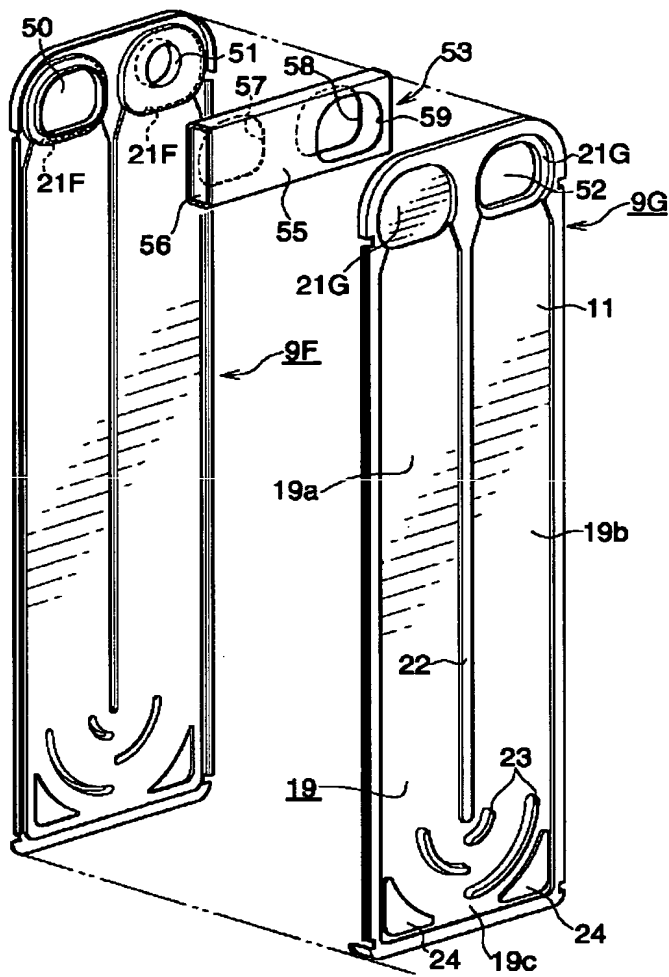
[Drawing 13]



[Drawing 12]



[Drawing 15]



[Translation done.]